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10/559,914	06/15/2006	Christopher Speirs	DE030204US1	2543

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EXAMINER	
LAM, VINH TANG	

ART UNIT	PAPER NUMBER
2629	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

ip.department.us@nxp.com

Office Action Summary	Application No.	Applicant(s)	
	10/559,914	SPEIRS ET AL.	
	Examiner	Art Unit	
	VINH T. LAM	2629	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *15 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on *15 June 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 8 objected to because of the following informalities: Typographical error.

"a_{ij}" should be "$a_{i,j}$" (i.e. a comma between i and j).

Appropriate correction is required.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested:

Energy saving passive matrix display device and method for driving the column voltage having minimum transitions.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims **1-9** and **13** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Scheffer et al. (US Patent No. 5485173)** in view of **Kobayashi (US Patent No. 6927785).**

Regarding Claim **1**, **Scheffer et al.** teach a display device comprising

a liquid crystal material between a first substrate provided with row electrodes and a second substrate provided with column electrodes, in which overlapping parts of the row and column electrodes define pixels (Col. **5**, Ln. **13-18**, Ln. **36-41**, FIG. **1** & **2**),

driving means for driving the column electrodes in conformity with an image to be displayed, wherein column voltages $G_j(t)$ are supplyable to the column electrodes, wherein the column voltages $G_j(t)$ to be supplied are selectable from a predetermined number of column voltages levels (Col. **6**, Ln. **11-19**, FIG. **1**); and

driving means for driving the row electrodes, wherein the row electrodes supply groups of p rows ($p \geq 1$) with mutually orthogonal selection signals for driving pixels (Col. **5**, Ln. **47-55**, FIG. **1**) and the groups of p rows are driven for the duration of a row selection time p times n_{frc} times during a superframe including n_{frc} frames for generating grey scales (Col. **11**, Ln. **55-58**, **66-68**, Col. **12**, Ln. **1-3**),

wherein a column voltage ($G_j(t)$) is calculated depending on the grey scales to be displayed by the p concurrently driven pixels in a column and depending on the used mutually orthogonal selection signals (F_i) for the corresponding group of rows (Col. **7**, Ln. **31-44**, Eq. **13**)

However, **Scheffer et al.** do not teach that the row selection time is subdivided in n_{pwm} sub selection time slots, phase mixing grey scales ,and column voltage ($G_j(t)$) has always less transitions per row selection time than the sub selection time slots.

In the same field of endeavor, **Kobayashi** teaches

wherein the row selection time is subdivided in n_{pwm} sub selection time slots and the grey scales are coded in grey scale tables having n_{frc} phases with n_{pwm} sub selection time slots (Col. **7**, Ln. **51-61**, FIG. **4**),

wherein a change in the column voltage level is defining a transition, and wherein the column voltage ($G_j(t)$) to be supplied to a column electrode has always less transitions per row selection time than the number n_{pwm} of sub selection time slots of the row selection time (Col. **7**, Ln. **66-68**, Col. **8**, Ln. **1-6**) for the benefit of reducing power consumption by reducing the column voltage transition during the sub selection time slots of the row selection time and improving image quality.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine **Scheffer et al.** teaching of driving the column voltage and its mutually orthogonal signal into **Kobayashi** teaching of minimizing the column voltage transitions during the sub selection time slots of the row selection time in order to benefit of reducing power consumption by reducing the column voltage transition during the sub selection time slots of the row selection time and improving image quality.

Regarding Claim **13**, method for driving a display device as claimed in claim 1 is rejected by the same rationale discussed above.

Regarding Claim **2**, display device as claimed in claim 1, wherein **Kobayashi** teaches a column voltage ($G_j(t)$) to be supplied to a column electrode during a row selection time changes at most twice within a row selection time by at most one column voltage level or once by two column voltage levels (Col. **7**, Ln. **51-61**, FIG. **4**).

Regarding Claim **3**, display device as claimed in claim 1, wherein **Kobayashi** teaches the column voltage ($G_j(t)$) to be supplied to a column electrode during a row selection time is calculated once per row selection time, wherein transitions in the column voltage $G_j(t)$ during the row selection time are provided by increasing or decreasing the column voltage level by the respective number of column voltage levels (Col. **7**, Ln. **51-61**, FIG. **4**).

Regarding Claim **4**, display device as claimed in claim 1, wherein **Kobayashi** teaches the grey scale table comprises a binary code for each of the x grey scales, each grey scale code appears only once, wherein the x grey scale codes are arranged in n_{frc} phases, each phase having n_{pwm} sub selection time slots, wherein all logical ones and zeros within each of these grey scale codes are grouped together such that the groups of logical ones or zeros in all grey scale codes are left-aligned or right-aligned, wherein the grey scale codes having a change from logical one to zero or vice versa within a phase are arranged, such that that part of the grey scale code that has the change within the phase is assigned to specific phases of the grey scale table, called PWM-phases (FIG. **4**).

Regarding Claim **5**, display device as claimed in claim 4, wherein **Kobayashi** teaches the grey scale codes, in the phases other than the PWM-phase do

not have a change in the code during the respective phases and therefore do themselves not provoke a transition of the column voltage ($G_j(t)$) (FIG. **4**).

Regarding Claim **6**, display device as claimed in claim 1, wherein **Kobayashi** teaches the phase mixing is based on phase mixing tables, which are stored, whereby a phase mixing table defines the phase in the grey scale table for a certain pixel and a certain frame (Col. **9**, Ln. **26-28**, FIG. **4** & **7**).

Regarding Claim **7**, display device as claimed in claim 4, wherein **Kobayashi** teaches the PWM-phase in the phase mixing table, appears only once per column in a phase mixing table for a group of p rows per frame (FIG. **4**).

Regarding Claim **8**, display device as claimed in claim 1, whereby **Scheffer et al.** teach the column voltage ($G_j(t)$) for each sub selection time slot that is part of the row selection time during which the corresponding p rows are selected, is calculated using the equation

$$G_j(t) = (1/\sqrt{N})\{ a_{0,j} * F_0(t) + a_{1,j} * F_1(t) + \ldots + a_{p-1,j} * F_{p-1}(t)\}$$

whereby N is the number of rows of the display, $F_i(t)$ are the orthogonal functions to be supplied to the row electrodes during the row selection time and $a_{i,j}$ are the pixel states with i as an index for the row given as the row number modulo 4 and j as an index for the column (Col. **7**, Ln. **51-61**, Eq. **13**),

wherein **Kobayashi** teaches the coded grey scales in the grey scale tables and the used phase mixing tables are adapted that the calculation of the column voltage $G_j(t)$ needs only to be performed once per row selection time, wherein a change in the

grey scale code of a certain pixel is realized by an increasing or decreasing of the column voltage level by one (Col. **7**, Ln. **51-61**, FIG. **4**).

Regarding Claim **9**, display device as claimed in claim 1, wherein **Kobayashi** teaches the column voltage $G_j(t)$ to be supplied to a column electrode (6) during a row selection time is calculated once per row selection time and a transition in the column voltage $G_j(t)$ within a row selection time is realized by increasing or decreasing the calculated column voltage level by one level (Col. **7**, Ln. **51-61**, FIG. **4**).

4. Claims **10-12** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Scheffer et al. (US Patent No. 5485173)** in view of **Kobayashi (US Patent No. 6927785)** and further in view of **Okamoto (US Patent No. 6094184).**

Regarding Claim **10**, **Scheffer et al.** and **Kobayashi** teach a display device as claimed in claim 1.

However, **Scheffer et al.** and **Kobayashi** do not teach a mirroring of the column voltage waveform is performed by calculating the column voltage $G_j(t)$ for the subsequent row selection time during the current row selection time.

In the same field of endeavor, **Okamoto** teaches a mirroring of the column voltage waveform is performed by calculating the column voltage $G_j(t)$ for the subsequent row selection time during the current row selection time (DATA4, FIG. **5a**) for the benefit of reducing power consumption by mirroring the column voltage transitions during the sub selection time slots of the row selection time and improving image quality.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to combine **Scheffer et al.** and **Kobayashi** teachings of driving the column voltage, its mutually orthogonal signal, and minimizing the column voltage transitions to **Okamoto** teaching of mirroring the column voltage transitions during the sub selection time slots of the row selection time in order to benefit of reducing power consumption by mirroring the column voltage transitions during the sub selection time slots of the row selection time and improving image quality.

Regarding Claim **11**, display device as claimed in claim 10, wherein **Okamoto** teaches the column voltage waveform is mirrored on a mirror axis in the middle of a row selection time (DATA4, FIG. **5a**).

Regarding Claim **12**, display device as claimed in claim 10, wherein **Okamoto** teaches the mirroring is performed adaptively only when the column voltage $G_j(t)$ at the end of the current row selection time is the same as the column voltage at the end of the following row selection time (DATA4, FIG. **5a**).

Conclusion

The prior arts made of record and not relied upon is considered pertinent to applicant's disclosure are: Yasui (US Patent No. 4769713), Ishii (US Patent No. 4827255), Garrett (US Patent No. 5068649), Bassetti Jr. et al. (US Patent No. 5185602), Saxena et al. (US Patent No. 5777590), and Reddy (US Patent No. 6175355).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to VINH T. LAM whose telephone number is (571)270-3704. The examiner can normally be reached on M-F (7:30-5:00) EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amare Mengistu can be reached on 571 272 1206. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/VTL/

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